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China: The Nonferrous Metals Industry in the 1970s

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China: The Nonferrous Metals Industry in the 1970s

*Central Intelligence Agency
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May 1978

Summary

China's nonferrous metals industry has made little progress during the 1970s. Production of most metals has grown slowly, despite the country's sizable resource base. Indeed, output of the major export metals—tungsten, tin, mercury, and antimony—is still below the level of the late 1950s. Aluminum is the only metal whose production grew sharply during the period.

The industry's lack of growth is a consequence of its low priority in receiving new investment. A lead and zinc plant and a few aluminum refineries are the only major nonferrous production facilities to come online in the 1970s. Further development of the industry will be costly. Many of China's nonferrous reserves lie in remote regions where mining and transport are difficult. In addition, as the richest ore bodies are worked out, expensive exploitation of lower-quality ores will become necessary.

The plant and equipment built with Soviet aid during the 1950s still forms the base of China's nonferrous industry. This technology is now 20 to 30 years old and is badly outdated by Western standards. Attempts to upgrade the technological level of the industry have had limited success. Peking is, however, showing increased interest in acquiring Western technology. Discussions have been held for copper and aluminum plants, and the Chinese are also seeking mining and drilling equipment. The Chinese have imported an advanced lead and zinc smelter, and obtained copper smelting technology from Japan.

Peking has been forced to supplement its lagging domestic metals production with imports. During the 1970s, \$2.6 billion worth of metals—chiefly aluminum, copper, nickel, and lead—has been imported. In contrast, exports totaled \$645 million. Peking will have difficulty expanding its sales as many of its potential export metals face slack world markets. China's main competitors for other metals are developing countries that Peking does not want to offend by adopting an aggressive export policy.

China: The Nonferrous Metals Industry in the 1970s

Background

China is well endowed with a wide variety of nonferrous metals. The country's overall resource position probably compares favorably with that of the United States or the USSR, although there is little hard information about Chinese mineral reserves. Most published data are based either on outdated foreign surveys from the pre-Communist era or greatly exaggerated Chinese claims made during the Cultural Revolution (1966-69). Moreover, the Chinese themselves are probably unwitting of the true size of their resource base. The country has not been thoroughly prospected, and mineral surveys—particularly of the more remote areas—are somewhat spotty.

China's richest reserves are of antimony, manganese, mercury, molybdenum, tin, and tungsten. Reserves of these metals are either the largest or among the largest of any country. China also has extensive deposits of aluminous ores, bismuth, gallium, and titanium. Supplies of copper, lead, and zinc are believed to be sizable.

Major deficiencies in the metals base are centered around alloying materials for the iron and steel industry. Deposits of nickel are small, and cobalt is found only as small parts of polymetallic ores. In addition, China has been historically short of chrome ores. Consequently, the Chinese are dependent on imports for almost all of these vital alloying materials.

Early Development

China's early economic plans called for the development of a strong metals industry to serve as a base for the industrialization of the country. With substantial Soviet technical and material aid, the nonferrous metals industry reached by

1957 an unprecedented level of production. Most of the metals required for development were provided domestically, and substantial quantities of selected nonferrous metals were available for export. During this period, survey work was undertaken, mines were opened, and new processing facilities were constructed.

The systematic development of the nonferrous metals industry came to a near halt during the Leap Forward years (1958-60). Facilities were badly overworked, and maintenance schedules were disregarded. In mid-1960 the Soviets withdrew their advisors, cutting China off from its major source of technology and equipment. The subsequent collapse of the Leap Forward saw output plummet for many of China's nonferrous metals.

Since the mid-1960s progress in the industry has been extremely uneven. Investment has lagged as other priority sectors have been emphasized. The Cultural Revolution and the power struggle following Mao's death also adversely affected orderly development. Although progress has been made in developing selected nonferrous metals, others have yet to regain production levels of the late 1950s.

Structure and Control

Nonferrous production facilities in China are divided into two broad groups. On the one hand, there are large national-level plants that produce metals for military and high-priority industrial users on a countrywide basis. These plants are usually under the Ministry of Metallurgical Industry and account for the bulk of production of most nonferrous metals. They are the best equipped and feature the most up-to-date tech-

nology available in China. By world standards, however, these plants are relatively small and utilize mostly outdated technology.

The local-level plants, on the other hand, are small, unsophisticated facilities that provide metals for local industrial needs and household use. These plants are usually labor intensive and feature little mechanized equipment. The technology employed is obsolete; in some cases ancient processing methods are used (see the figure). The quality of output of these plants is inferior to that of the larger installations and is unsuitable for applications that require high-quality specifications. These small facilities are often under provincial control, although in some cases they are responsible to local authorities.

The structure of the nonferrous mining industry is similar to the processing industry. The largest and richest ore bodies are generally con-

trolled by the central government, while provincial and local authorities exploit the smaller, more scattered deposits of lower-quality ores. The large mines have a decided edge in design, safety, and equipment. The provincial and local mines, in contrast, are often rather primitive affairs, which are worked by labor-intensive techniques. Provincial and local mining efforts are frequently centered around easily accessible ore deposits. Often, little thorough mapping of the ore body is done, and when the ore near the surface is depleted, the mines are frequently abandoned. This type of mining is both wasteful and inefficient, as substantial reserves may be passed over and excessive efforts are spent on locating and opening new mines.

Production During the 1970s

Production of nonferrous metals has stagnated during the 1970s (table 1). Output of copper and



A Primitive Local Copper Smelter

aluminum has failed to keep up with rising domestic requirements, thus increasing Peking's dependence on foreign suppliers. Production of traditional export metals—mercury, tin, tungsten, and antimony—has not grown enough to enable China to market greater quantities abroad. In addition, the Chinese have failed to exploit their large reserves of manganese, molybdenum, and zinc to the extent necessary to become a major exporter.¹

Aluminum is the only segment of the nonferrous industry that has grown sharply during the 1970s. Production doubled as new capacity became operational and reached 375,000 tons in 1976. The copper industry, in contrast, has had almost no growth. Production, which totaled 290,000 tons in 1970, advanced to only 300,000 tons in 1976. China's production of manganese has been sufficient for domestic needs. Output jumped 46 percent between 1970 and 1975 as growing steel production increased domestic demand. Manganese output fell an estimated 13 percent in 1976, however, as a decline in steel output dampened internal requirements.

Tungsten and antimony production grew steadily between 1970 and 1973. Since then, however, tungsten output is down by more than one-third and antimony by 20 percent. Similarly, tin output grew strongly through 1975 but fell

¹ See the appendix for detailed estimates of production of individual metals.

almost 40 percent in 1976. Of the major export metals, only mercury production remained strong during the period. Output in 1976—18,000 flasks—equaled the peak for the period but was still less than 40 percent above the 1970 level.

The industry's poor performance during the 1970s reflects its low priority in receiving investment resources. Peking has emphasized agricultural development and the petroleum, transportation, and chemical fertilizer industries, leaving limited resources for development of the nonferrous metals industry. This neglect has resulted in an industry that has failed to develop new sources of raw materials. It remains largely dependent on outdated production technology and is badly in need of new refining capacity to boost output.

Besides lagging investment, high development costs have also restrained nonferrous production. Many of China's nonferrous reserves lie in remote regions of the south and southwest. The terrain is difficult, and the transportation network is not fully developed. Moreover, some of the richest, most accessible deposits are probably worked out, so new expansion would be costly.

Technology

The technology employed in China's nonferrous metals industry is largely Soviet and is now 20 to 30 years old. As a result, costs per unit of output are high, and yields and quality are often

Table 1

China: Estimated Production of Selected Nonferrous Metals

	1970	1971	1972	1973	1974	1975	1976 ¹	Thousand Metric Tons
Aluminum	188	192	238	286	316	357	375	
Antimony	5.0	8.4	9.9	10.6	8.9	8.0	8.4	
Copper	290	290	290	290	300	300	300	
Manganese	1,241	1,468	1,601	1,772	1,670	1,506	1,563	
Mercury ²	13	15	13	17	18	15	18	
Tin	10	13	13	15	15	18	11	
Tungsten ³	11.5	16.3	16.6	18.7	17.1	14.1	11.9	

¹ Preliminary.

² Thousand 76-pound flasks.

³ Standard concentrates containing 60-percent WO₃.

low. Indeed, the Chinese can probably import many metals for less than the cost of domestic production.

China has made only limited progress in its own attempts to upgrade the technological level of this industry. Although indigenous improvements have been made at some installations, the plant and equipment built with Soviet assistance during the 1950s is still the backbone of the industry.

Peking currently is showing increased interest in beefing up its nonferrous metallurgy by importing technology and equipment from the West. The Chinese have been looking at large aluminum plants, and negotiations have been held for equipment and technology for the copper industry. In addition, Chinese delegations have been shopping for mining and drilling equipment in the United States, Japan, and Western Europe.

China has obtained some Western technology in the past. The most important acquisition was a lead and zinc plant built under license from the United Kingdom. This plant uses the British-developed imperial smelting process. Given the low level of China's domestic research and development, more purchases of this type are necessary if Peking is to increase the efficiency and capacity of its nonferrous metals industry.

Trade

The poor performance of the nonferrous metals industry has forced Peking to import huge quantities of metals. From 1970 to 1976 nonferrous imports—valued at \$2.6 billion—were more than four times larger than exports (table 2). The deficit on this trade approached \$2 billion. The deficit in 1970—\$190 million—grew to \$439 million in 1973. It has declined steadily since then and stood at \$242 million in 1976. Although exports have grown moderately, most of the improvement in metals trade was caused by the sharp drop in Chinese nickel purchases in 1975 and 1976. Nickel imports in those two years averaged \$85 million less than the 1974 level.

China's exports are dominated by tin, tungsten, and antimony. They accounted for 93 percent of nonferrous sales in 1976. Markets for all of these metals are thin; changes in Chinese sales or pricing policies have the potential to impact heavily on world markets. Although China could increase sales of tin and tungsten, export gains would be at the expense of developing countries. Peking has not joined the International Tin Council or the Primary Tungsten Association but has generally followed their pricing procedures and export limitations. The Chinese realize that large sales increases or sharp price cutting would complicate their relations with the developing countries. Markets for many other potential export

Table 2

China: Share of Nonferrous Metals in Total Trade

	Exports			Imports		
	Nonferrous Metals			Nonferrous Metals		
	Total (Million US \$)	Million US \$	Percent of Total	Total (Million US \$)	Million US \$	Percent of Total
1970.....	2,080	53.3	2.6	2,245	243.6	10.9
1971.....	2,455	62.8	2.6	2,310	194.8	8.4
1972.....	3,150	60.0	1.9	2,850	274.5	9.6
1973.....	5,075	86.8	1.7	5,225	525.9	10.1
1974.....	6,660	107.2	1.6	7,420	534.4	7.2
1975.....	7,180	158.7	2.2	7,395	478.3	6.5
1976 ¹	7,250	116.2	1.6	6,005	357.7	6.0
Total	33,850	645.0	1.9	33,450	2,609.2	7.8

¹ Preliminary

metals are weak. Low growth rates in the industrialized nations have dampened requirements for mercury, antimony, and zinc. In addition, the particularly poor performance of the world steel industry has reduced the need for manganese.

China's imports are led by copper, aluminum, nickel, and lead. These metals accounted for \$320 million of China's \$358 million of nonferrous imports in 1976 (tables 3 and 4). Nonferrous imports have relatively little impact on other

Table 3
China: Nonferrous Metals Trade

	1970			1974			1976 ¹			Thousand US \$
	Exports	Imports	Balance	Exports	Imports	Balance	Exports	Imports	Balance	
Aluminum .....	..²	14,843	-14,843	..	72,520	-72,520	..	124,432	-124,432	
Antimony	4,757	..	4,757	15,237	..	15,237	18,747	..	18,747	
Bismuth	27	..	27	..	..	..	..	..	..
Cadmium .....	..	138	-138	..	42	-42	..	51	-51	
Chrome .....	..	4,529	-4,529	..	9,539	-9,539	..	14,880	-14,880	
Cobalt .....	..	701	-701	..	13,015	-13,015	..	705	-705	
Copper	303	148,250	-147,947	774	289,710	-288,936	..	161,000	-161,000	
Gallium .....	..	..	..	500	..	500	47	..	47	
Lead	14	9,259	-9,245	496	20,790	-20,294	315	17,204	-16,889	
Magnesium .....	..	1,659	-1,659	..	4,438	-4,438	..	4,274	-4,274	
Manganese	891	..	891	1,885	..	1,885	1,055	..	1,055	
Mercury	1,131	..	1,131	2,090	..	2,090	719	..	719	
Molybdenum .....	..	..	..	136	..	136	..	..	..
Nickel .....	..	38,880	-38,580	..	105,187	-105,187	..	17,255	-17,255	
Platinum .....	..	16,860	-16,860	..	7,477	-7,477	..	4,150	-4,150	
Tantalum .....	..	..	..	..	60	-60	..	..	..
Tin	19,867	..	19,867	46,901	..	46,901	46,372	..	46,372	
Titanium .....	..	507	-507	433	924	-491	450	815	-365	
Tungsten	26,178	319	25,859	36,122	929	35,193	43,005	740	42,265	
Zinc	90	7,666	-7,576	2,615	9,720	-7,105	5,472	12,150	-6,678	
Total	53,258	243,611	-190,353	107,189	534,351	-427,162	116,182	357,656	-241,474	

¹ Preliminary.

² An ellipsis represents zero.

Table 4
China: Nonferrous Metals Trade with Selected Countries

	1970			1974			1976 ¹			Million US \$
	Exports	Imports	Balance	Exports	Imports	Balance	Exports	Imports	Balance	
Canada .....	..²	15.4	-15.4	1.5	93.7	-92.2	Negl	22.4	-22.4	
Chile .....	..	..	..	..	80.0	-80.0	..	40.0	-40.0	
France	6.6	5.3	1.3	11.1	4.5	6.6	4.9	1.5	3.4	
Japan	3.4	30.3	-26.9	7.7	80.5	-72.8	4.7	9.5	-4.8	
Netherlands	2.3	Negl	2.3	9.8	0.6	9.2	6.5	0.1	6.4	
Norway	Negl	Negl	Negl	Negl	9.6	-9.6	Negl	15.1	-15.1	
Peru .....	..	..	..	..	55.0	-55.0	..	50.0	-50.0	
UK	1.5	68.1	-66.6	0.9	14.6	-13.7	0.5	2.9	-2.4	
US .....	..	..	..	11.4	0.5	10.9	15.6	29.3	-13.7	
West Germany	2.9	24.3	-21.4	4.9	7.1	-2.2	5.7	18.5	-11.8	
Total	16.7	143.4	-126.7	47.3	346.1	-298.8	37.9	189.3	-151.4	

¹ Preliminary.

² An ellipsis represents zero.

countries. Copper imports from Chile, China's major supplier, comprised only 4 percent of Chile's total copper exports in 1976. Imports from Peru accounted for 19 percent of sales. The huge jump in aluminum imports in 1975 gave China about 10 percent of world exports. There was little effect on prices in the glutted world market, however, and imports dropped considerably in 1976.

In 1976, no single country stood out as dominant partner in China's nonferrous trade. With the exception of Chile and Peru, China's two major copper suppliers, only the United States and West Germany accounted for more than 5 percent of trade. The United States was the third leading supplier, with sales of \$29 million, and the top buyer, with purchases of \$16 million. Other prominent suppliers were Canada, West Germany, Norway, and Japan. The Netherlands and West Germany, both with imports of about \$6 million, followed the United States as major purchasers of Chinese metals.

Outlook

There are indications that China will attempt to speed development of its nonferrous metals industry. Tang Ke, the Minister of Metallurgical Industry, recently called for improvement in output, quality, and technology. He also stated that China was determined to surpass the United States in nonferrous production by the end of the century. At the Fifth National People's Congress in February 1978, Premier Hua Kuo-feng stated that by 1985 China plans to build or complete 120 major projects, including nine nonferrous metals complexes.

Despite renewed emphasis on advancing output, it is likely that progress will be slow. Development will be costly, and it will take years to put new plant and equipment into production. China will consequently remain dependent on imports of many vital metals well into the 1980s.

APPENDIX

CHINA'S PRODUCTION AND TRADE IN SELECTED NONFERROUS METALS

Aluminum	Gallium	Nickel
Antimony	Lead	Platinum
Bismuth	Magnesium	Tantalum
Cadmium	Manganese	Tin
Chrome	Mercury	Titanium
Cobalt	Molybdenum	Tungsten
Copper		Zinc

Aluminum

China has large reserves of aluminous ores. Estimates of reserves range from 140 million to 360 million tons of recoverable aluminum. Most of these ores, however, are uneconomic by Western standards. They contain high amounts of silicon and must be refined by a complex process that uses relatively large amounts of ore, electric power, and caustic soda per ton of output.

Aluminum production has grown rapidly in recent years. Output in 1976 is estimated at 375,000 tons, double the 1970 level of 188,000 tons. This sharp production gain is the result of large investment in new capacity made in response to rapidly rising domestic demand. Peking's program to improve electric power transmission and extend electrification to rural areas has been the principal reason for increasing consumption as aluminum is substituted for more expensive copper cable. Estimated aluminum production is as follows (in thousand tons):

1970	1971	1972	1973	1974	1975	1976
188	192	238	286	316	357	375

Despite increasing production, aluminum demand continues to outstrip supply. As a result, China has been forced to purchase considerable quantities on world markets (table A-1). Average imports were 76,000 tons in 1970-74. Imports skyrocketed in 1975 to 408,000 tons, which placed China among the world's largest importers that year as Peking took advantage of low prices to build up stocks. Imports fell to 177,000 tons in 1976 but were still higher than any year before 1975.

China's aluminum production will continue to grow moderately. Peking will probably build some new aluminum plants on its own, and China has been shopping for a modern aluminum plant in Japan and Western Europe. Nevertheless, imports will be required to supplement domestic production for many years.

Table A-1

China: Imports of Aluminum¹

	1957	1965	1970	1971	1972	1973	1974	1975	1976 ²
	Thousand Metric Tons								
Australia	3		1	9	21	3			3
Bahrain							3	17	
Belgium-Luxembourg				2					
Canada			5	5	6	15		33	23
France		3	Negl	4	10	12	5	48	1
Hungary				19	28	30			
Iceland					3	2			
Iran							5		
Italy				1					
Japan		1	2	16	6		7	38	10
Norway				2	14	25	4	50	18
Romania			2	10	9				
Singapore							1		
Sweden				3		5			
UK			4				1	23	3
US						5		63	37
West Germany							6	27	22
Yugoslavia				2		4			
Other ³	3	1	6	2	3	9	43	109	60
Total ⁴	4	5	20	75	102	110	75	408	177
Thousand US \$									
Value ⁵	4,828	2,662	14,843	36,118	44,472	62,678	72,520	300,000	124,432

¹ Information derived from trading partner information and includes aluminum ingots and rolled products.² Preliminary.³ An ellipsis represents zero.⁴ Estimates. Most of figures for recent years probably originates in the USSR, Eastern Europe, and Bahrain. Trade data from these countries are either unavailable or incomplete.⁵ In addition, China imported alumina from Guyana, approximately as follows: 1972—37,000; 1973—37,500; 1974—60,000 tons.⁶ The value of alumina imports from Guyana is included in the total (see footnote 5, above).

Antimony

China's reserves of antimony ore—about 2 million tons—are the world's largest. Indeed, about half of world reserves are located in China. The ore contains from 2- to 25-percent antimony, with most ores probably falling near the lower end of the range.

Prior to the Communist takeover, China produced up to 40,000 tons of antimony per year. Output was negligible in 1949 but jumped to 12,000 tons by 1958. Production slid back in the 1960s and then recovered somewhat in the early 1970s. Antimony production in the 1970s is estimated as follows (in thousand tons):

1970	1971	1972	1973	1974	1975	1976
5.0	8.4	9.9	10.6	8.9	8.0	8.4

China's consumption of primary antimony is only about 3,000 tons a year. Thus, large quantities are available for export (table A-2). Antimony sales in 1976 totaled about 5,400 tons, down from the 1973 figure of 7,600 tons. Rising prices, however, increased China's earnings to almost \$19 million. Major recipients of China's antimony include Japan, France, the United States, and West Germany.

World demand for antimony is rising slowly. Unless Chinese antimony replaces that of other producers—primarily South Africa and Bolivia—there is little likelihood of a large increase in exports. Domestic demand will also grow slowly, so little expansion is foreseen in the industry. Most development will center around the opening of new deposits as older ones are worked out.

Table A-2

China: Exports of Antimony

	1957	1965	1970	1971	1972	1973	1974	1975	1976 ¹
	Metric Tons (Metal Content)								
Austria	2	...	...	...	40	...	...	3	...
Belgium-Luxembourg	67	...	311	75	229	14	16	15	...
Canada	472	...	...	...	...	...	...	62	135
Denmark	...	5	65	55	5	27	1	...	...
France	1,202	26	295	524	860	415	207	150	...
Iran	60	...	620	...	...	...	...	...	...
Italy	...	...	...	122	...	...	20	13	...
Japan	686	739	1,850	1,403	2,997	1,100	1,877	1,302	...
Netherlands	30	42	3	...	70	49	6	3	26
Norway	65	72	20	10	...	80	...	15	...
Pakistan	...	...	...	...	...	10	6	...	...
Poland	1,650	...	...	...	...	...	...	200	400
Spain	...	...	...	84	...	...	8	...	60
Sweden	40	...	...	...	...	...	...	46	20
Switzerland	47	...	56	85	179	89	...	107	72
US	...	...	...	...	987	400	601	698	1,180
USSR	100	...	...	270	94	150	60	60	46
West Germany	1,070	780	172	453	685	336	142	137	227
Other ²	66	551	979	1,441	2,576	2,395	2,916	1,566	1,741
Total	3,500	3,500	2,000	5,400	6,900	7,600	5,900	5,018	5,387
Thousand US \$									
Value	1,473	2,865	4,757	4,726	5,720	9,241	15,237	16,258	18,747

¹ Preliminary.² An ellipsis represents zero.³ Mostly estimated sales to Communist countries other than the USSR.

Bismuth

Little is known of China's bismuth industry. Reserves are reportedly large, and there have been scattered references to bismuth mining. Additional bismuth is probably recovered as a byproduct of lead and copper refining.

China exported moderate amounts of bismuth in the 1950s and 1960s (table A-3). Sales in 1965 amounted to 80 tons valued at \$477,000. West Germany, France, and the Netherlands were the leading importers. During the 1970s exports ceased. Two tons were sold in 1970, only one ton in 1971, and no exports have been noted since.

No Chinese bismuth imports have been observed, indicating that domestic production covers demand. Major uses include alloys and pharmaceuticals. China should be able to increase output to meet its own needs and could likely develop an exportable surplus. No efforts to produce for export have been noted in recent years.

Cadmium

Very little information is available on cadmium. Practically all cadmium is a byproduct of zinc production. Zinc output has been rising during the decade, indicating that cadmium production also may have registered some gains.

China has periodically entered the market to export cadmium (table A-4). Thirty-eight tons were exported in 1971. No exports have been noted since. Small amounts of cadmium have been imported during the 1970s, including 10 tons in 1976. The low level of imports suggests that China is largely self-sufficient.

Table A-3

China: Exports of Bismuth

	1957	1965	1970	1971
	Metric Tons			
France	1	19	—	—
Netherlands	—	8	1	—
Poland	20	—	—	—
West Germany	—	51	—	—
Other	5	2	1	—
Total	25	80	2	1
	Thousand US \$			
Value	128	477	27	14

¹ An ellipsis represents zero.

Table A-4

China: Trade in Cadmium

	1965	1970	1971	1972	1973	1974	1975	1976 ¹
	Metric Tons							
Imports								
Japan	— ²	—	10	18	65	—	—	—
Other	—	25	35	7	5	5	10	10
Total	—	25	45	25	70	5	10	10
	Thousand US \$							
Value	—	138	207	147	528	42	49	51
	Metric Tons							
Exports								
France	1	—	—	—	—	—	—	—
UK	—	—	38	—	—	—	—	—
West Germany	10	—	—	—	—	—	—	—
Total	11	—	38	—	—	—	—	—
	Thousand US \$							
Value	46	—	160	—	—	—	—	—

¹ Preliminary.² An ellipsis represents zero.

Chrome

China's reserves of chrome ore are sharply limited. A deposit has been reported in Hopeh, and scattered amounts may be found in Inner Mongolia, Sinkiang, Tsinghai, and Tibet. These fall far short of meeting requirements. Production is unknown but is undoubtedly small.

China is dependent on imports for virtually all of its chrome supplies (table A-5). During the 1950s, the Soviet Union was China's major source of chrome. Imports ceased in 1961, however, and Peking turned to Albania for most of its needs. In recent years Iran, Pakistan, Sudan, and Turkey have also sold China small quantities of chrome.

Chinese demand for chrome probably exceeds supply. Consumption is low by world standards, but demand is rising rapidly. The Chinese have attempted to substitute other materials for chrome in some of its applications. Other metals have been used for plating, for example, and aluminum has been used in place of chrome in the refractory bricks used to line open hearth furnaces. Chrome requirements will, nevertheless, continue to grow. Most of these needs will have to be met by imports.

Cobalt

China's known cobalt resources are limited to small fractions of cobalt contained in polymetallic ores. Cobalt is also a byproduct in the production of copper and calcium magnesium phosphate fertilizer. Output from both sources is small.

The majority of China's cobalt requirements are met through imports (table A-6). Imports reached 1,900 tons in 1974 before dropping sharply in 1975 and 1976. During the 1970s, Morocco and Belgium-Luxembourg have been the principal cobalt suppliers. Until 1960, the USSR was the major source. The USSR again forged to the front in 1976, as it was the only country noted shipping cobalt to China. The production of high-purity cobalt, as well as the processing of imported concentrates and domestic ores, apparently takes place at a refinery in Shanghai.

Table A-5

China: Imports of Chromium¹

	1957	1965	1970	1971	1972	1973	1974	1975	1976 ²
	Thousand Metric Tons								
India	7	...	...	...	...	...	...	...	...
Iran .....	...	...	6	16	29	47	...	...	...
Pakistan .....	...	...	3	2	6	7	1	6	1
Sudan .....	...	...	...	...	6	...	5	...	...
Turkey .....	...	...	...	...	20	20	...	...	...
USSR	8	...	...	...	...	...	...	...	...
Other	5	90	131	142	188	176	114	305	371
Total	20	90	40	160	240	250	220	311	372
Thousand US \$									
Value	535	2,762	4,529	7,103	10,018	7,906	9,539	13,062	14,880

¹ Almost entirely ores and concentrates.² Preliminary.³ An ellipsis represents zero.⁴ Rough estimates to cover information derived from various sources on contractual arrangements above the estimates derived from country data.

Table A-6

China: Imports of Cobalt

	1957	1965	1970	1971	1972	1973	1974	1975	1976 ¹
	Metric Tons (Metal Content)								
Belgium-Luxembourg .....	...	295	...	13 ³	200	250 ³	850	...	...
Middle East-Africa .....	...	200	200	...	430	280	560	563	...
USSR	22	...	...	...	...	50	80	80 ⁴	80 ⁴
West Germany .....	...	...	...	...	...	...	9	...	...
Other	28	5	50	87	400	450	401	...	...
Total	50	500	250	100	1,030	1,030	1,900	643	80
Thousand US \$									
Value	246	2,030	701	313	3,681	5,799	13,015	5,316	705

¹ Preliminary.² An ellipsis represents zero.³ An estimated 90 percent of exports of other minerals exported from Belgium-Luxembourg to China was cobalt.⁴ Estimates.

Copper

China's copper reserves are estimated to contain 6 million tons of recoverable copper. At current production rates, these reserves will last only 20 years and are insufficient to support a significant expansion of the industry. It is likely, however, that further prospecting will result in the discovery of more copper ore, as many areas appear geologically promising.

China's copper industry has stagnated in recent years. Output in 1976 is estimated at 300,000 tons, just 10,000 tons more than the 1970 level. The lack of growth in copper production stems primarily from China's failure to invest in new production facilities. No new refining capacity has been added since the late 1960s. Estimated Chinese copper output is as follows (thousand metric tons):

1970	1971	1972	1973	1974	1975	1976
290	290	290	290	300	300	300

The lack of growth in domestic production has forced Peking to increase imports to meet growing demand (table A-7). Copper imports have averaged almost 120,000 tons per year during 1970-76, at an average cost of \$180 million per year. In comparison, copper imports in 1965 were only 30,000 tons and cost \$38 million (table A-8). Chile and Peru supplied more than half of 1976 imports.

There are indications that China is attempting to increase its copper production. Peking is also negotiating for the purchase of a copper refinery. Although these facilities would increase domestic output, China will not become self-sufficient in the near future.

Table A-7
China: Imports of Copper¹

	1957	1965	1970	1971	1972	1973	1974	1975	1976 ²
	Thousand Metric Tons								
Belgium-Luxembourg	?	4.3						0.2	
Canada						8.7		5	
Chile	4.0		16.3	45.4	55.5	41.5	13.8	41	
Finland	0.5								
France				0.3					
Hong Kong		0.1	0.9			0.4	0.1		
Italy		0.3					0.2		
Japan	0.1	0.3	14.1	1.3	2.4	6.8	34.3	13.0	3
Morocco ³		0.2	0.5	0.6	0.4	0.4	1.1	0.6	
Peru				10.9	25.7	26.8	25.0	27.9	35
Philippines ⁴							9.0	13	
Sweden					2.3	1.5	Negl	Negl	
Switzerland	0.4				Negl	Negl	Negl	Negl	
UK		5.6	19.7	9.1	Negl	35.6	5.0	0.1	15
USSR	0.7	0.3							
West Germany		19.2	9.3	2.7	Negl	9.0	0.4	Negl	
Yugoslavia								3.0	11
Zambia			31.0	44.3	16.1	12.0	18.0	17.7	12
Other	1.8	4.3	5.3	3.9	7.4	22.4	6.6	4.4	6
Total	3	30	80	90	100	170	141	90	142
	Thousand US \$								
Value	3,479	38,200	148,250	101,349	139,363	296,050	289,710	100,960	161,000

¹ Including wirebars, cathodes, anodes, and products

² Preliminary

³ An ellipsis represents zero

⁴ Concentrates converted to copper by multiplying by 0.2

⁵ Concentrates converted to copper by multiplying by 0.27

Table A-8
China: Exports of Copper

	1957	1965	1970	1971	1972	1973	1974	1975	
	Metric Tons								
Belgium-Luxembourg	?			350	152			165	
Denmark						2		Negl	
Egypt	306								
Hong Kong	166		9	9	463	1,055	15	Negl	
Iran					5	48	10	Negl	
Italy	201					103	Negl	97	
Japan								10	
Netherlands				88					
Pakistan						283	275	260	
Sri Lanka						1			
Tanzania			71	2,858	64	Negl	36	Negl	
UK		20				258			
West Germany									
Other	200	107	120	95	116	52	62	38	
Total	200	800	200	3,400	800	1,800	400	570	
	Thousand US \$								
Value	199	619	303	3,942	889	2,665	774	666	

¹ An ellipsis represents zero

Gallium

China is believed to have large reserves of gallium. No estimates are available, however, for reserves or production. As in other countries, China's gallium is a byproduct of the aluminum and zinc industries. Rising production of these metals suggests that gallium output is also increasing.

China has been a minor exporter of gallium in the last few years (table A-9). Exports peaked in 1973, when they totaled \$800,000. Exports fell sharply since then, to only \$47,000 in 1976. Recent reports indicate that China currently has gallium available for export. The major use of gallium is in an arsenic-phosphorus alloy used in light-emitting diodes.

Table A-9
China: Exports of Gallium, Indium, and Thallium

	Thousand US \$					
	1971	1972	1973	1974	1975	1976 ¹
Belgium-Luxembourg			19			
Netherlands			66	55		
UK				273		
West Germany		10	61	15		47
Other	50	240	654	157		
Total	50	250	800	500	...	47

¹ Preliminary

² An ellipsis represents zero

Lead

China's lead reserves are moderately large. Reserves were claimed to be 3 million tons in 1957. As in other countries, lead is closely associated with zinc. Hunan and Yunnan have the major ore bodies, but sizable reserves are also located in the northeast, Kwangtung, Kiangsi, Kansu, Fukien, Sinkiang, and Inner Mongolia.

China's lead production is probably a little over 100,000 tons per year. A major addition to capacity came online in the 1970s. This plant uses the British-developed imperial smelting process. The current level of output at this plant is unknown, but continuing imports indicate that it may not have reached designed production levels yet.

China has maintained its lead imports at a high level during the last few years (table A-10). Imports peaked in 1975 when 49,000 tons were purchased. Major suppliers include Peru, Canada, and North Korea. In addition, China exports small quantities of lead, primarily to Pakistan (table A-11).

It is likely that China's lead production will continue to grow slowly. Thus, the level of imports may be reduced by the early 1980s, but small purchases may be needed to supplement domestic output for some time.

Table A-10

China: Imports of Lead

	1957	1965	1970	1971	1972	1973	1974	1975	1976 ¹	
	Metric Tons									
Australia	2				2,750					
Belgium-Luxembourg		330								
Burma					2,000					
Canada						2,099			14,498	8,347
France		1,266			1,501					
Japan		163	400	100				2,998	9,295	
Netherlands							100			
Peru					3,400	5,199	5,000	13,000	18,500	13,000
UK		4,365	26,335	4,595	6,027	9,023				
West Germany							1,000			
Other ²		876	265	654	675	9,977	16,902	6,707	16,053	
Total		7,000	27,000	15,000	14,000	25,000	33,000	49,000	37,400	
	Thousand US \$									
Value		2,317	9,259	4,378	4,048	12,045	20,790	18,620	17,204	

¹ Preliminary² An ellipsis represents zero.³ Country of origin unknown; a considerable portion probably came from North Korea, Burma, and other countries, either directly or via the London Metals Exchange.

Table A-11

China: Exports of Lead

	1957	1965	1970	1971	1972	1973	1974	1975	1976 ¹	
	Metric Tons									
Hungary	298	2								
Japan		10					50			
Norway							75			
Pakistan						451	697	650	530	
Poland	50 ²									
Tanzania					177		8			
USSR	16,100 ³									
Other ⁴	552	40	50	100	23	49	17	50	100	
Total	17,000	50	50	100	200	500	847	700	630	
	Thousand US \$									
Value	2,263	14	14	25	86	198	496	280	315	

¹ Preliminary² An ellipsis represents zero.³ Concentrate⁴ Rough estimates

Magnesium

Production of magnesium is believed to be small. China obtains some magnesium from its reserves of magnesite. Magnesium may also be obtained from sea water, but China is not thought to have a significant capability in this area.

China meets most of its magnesium needs through imports (table A-12). In 1972 these totaled almost 5,000 tons. Purchases have fallen sharply since then; in 1976 only 1,700 tons, worth about \$4 million, were imported.

Magnesium is primarily used for structural aluminum and magnesium alloys in machinery, aircraft, and missiles. The metal's light weight also makes it desirable for transportation equipment. China's growing transportation and military sectors will require increasing quantities. Future increases in consumption most likely will be met through imports.

Manganese

Chinese manganese reserves have been estimated at 25 million tons of 45-percent metal-content ore. More recent claims indicate reserves of 100 million to 300 million tons. The latter estimate, which is probably exaggerated, would place China third in world reserves. In any event, reserves are adequate for foreseeable needs.

Manganese production has followed steel output closely. Output grew from only 40,000 tons in 1950 to almost 1.3 million tons in 1960. Production fell back to 880,000 tons in 1965 but resumed its growth in the 1970s. In 1975 production totaled an estimated 1.8 million tons. Manganese production is as follows (in thousand tons):

1970	1971	1972	1973	1974	1975	1976
1,241	1,468	1,601	1,772	1,670	1,806	1,563

China exports small amounts of manganese, primarily to Japan and West Germany (table A-13). A steady reduction in Japanese imports since 1974 is the primary reason behind the fall in total exports in 1975 and 1976. Manganese is a poor foreign exchange earner; in the peak year of 1975, sales were valued at only \$2.5 million.

Peking should have little trouble expanding manganese production. Greater domestic demand stemming from renewed growth in the steel industry should easily be met. In addition, China could expand foreign sales sharply, but thus far Peking has shown little inclination to produce additional quantities for the export market.

Table A-12
China: Imports of Magnesium Metal

	1957	1965	1970	1971	1972	1973	1974	1975	1976 ¹
	Metric Tons								
Canada	75	.. ²	..	..	200	767	..	..	..
Japan	7	..	30	..	..	..	..	..	..
Norway .....	..	..	1,765	1,150	3,400	1,373	1,542	144	..
UK .....	..	..	..	..	301	..	1,117	..	..
West Germany .....	..	..	..	..	..	..	52	18	35
Other	118	200	5	550	999	2,660	189	1,338	1,665
Total	200	200	1,800	1,700	4,900	4,800	2,900	1,500	1,700
	Thousand US \$								
Value	176	190	1,659	1,392	3,795	4,000	4,438	3,916	4,274

¹ Preliminary.

² An ellipsis represents zero.

Table A-13
China: Exports of Manganese Ores and Concentrates

	1957	1965	1970	1971	1972	1973	1974	1975	1976 ¹
	Metric Tons								
Australia .....	..²	..	3,405	3,320	2,980	..	..	..	..
Belgium-Luxembourg .....	..	..	..	..	..	..	75	..	..
Denmark .....	..	1,951	2,000	2,200	2,000	1,600	1,106	898	..
Egypt .....	..	239	..	..	..	..	..	..	..
France .....	..	3,463	500	..	2	200	254	117	10
Italy .....	..	5,087	..	..	..	..	..	1,039	350
Japan .....	..	10,000	32,000	39,428	39,379	42,281	56,728	44,959	5,210
Netherlands .....	..	275	..	..	..	..	29	46	..
Pakistan .....	..	..	..	..	..	..	..	..	..
Spain .....	..	..	..	..	..	..	..	536	240
Sweden .....	..	..	..	..	..	..	1,121	..	..
UK .....	..	3,000	..	..	..	..	..	..	..
West Germany .....	..	9,024	..	1,530	..	..	870	1,126	1,341
Other ³	5,000	4,961	5,095	5,522	5,639	5,769	5,385	4,861	5,349
Total	5,000	38,000	43,000	52,000	50,000	51,000	65,000	53,000	12,500
	Thousand US \$								
Value	149	1,395	891	1,191	1,333	1,271	1,885	2,530	1,055

¹ Preliminary.

² An ellipsis represents zero.

³ An estimated 5,000 tons were exported annually to other Communist countries; small amounts to non-Communist countries were not reported in official statistics.

Mercury

Estimated mercury reserves of about 400,000 flasks place China among the world leaders. The vast majority of reserves are located in an area from the Hunan-Szechwan border to northern Yunnan and south to Kwangsi. Ore content is estimated to average between 1 and 4.5 percent. Mercury reserves are usually located in small pockets, thus making small-scale mining operations predominant.

Mercury production has fallen considerably since the peak of more than 75,000 flasks was produced in 1961. Output is estimated at 13,000 flasks in 1970 and had climbed to only 18,000 flasks by 1976. Estimated mercury production for 1970-76 is as follows (in thousand flasks):

1970	1971	1972	1973	1974	1975	1976
13	15	13	17	18	15	18

Aside from the sharp decline in 1975, mercury exports have experienced moderate increases during the 1970s (table A-14). Exports were about 8,000 flasks in 1976, compared to 5,000 flasks in 1970. The value of exports, however, has dropped dramatically during the last few years. The average price of mercury exported dropped from \$261 a flask in 1974 to about \$90 a flask in 1976. Consequently, China's export earnings fell from \$2 million in 1974 to \$719,000 in 1976 for roughly the same quantity of exports.

China's mercury consumption has increased from about 8,000 flasks in 1970 to 10,000 flasks in 1976. Increased pesticide production as well as higher production of chemicals and electrical equipment that use mercury contributed to the rise in consumption. Any future increases for domestic use or export can easily be met through China's huge reserves.

Table A-14

China: Exports of Mercury

	1957	1965	1970	1971	1972	1973	1974	1975	1976 ¹
	76-Pound Flasks ²								
Austria.....	3						58	58	58
Finland.....		174					151		
France.....		928	116			493	1,131	1,044	435
Hong Kong.....		232	40	101	50	164	232	367	2,058
Japan.....		348		174					
Netherlands.....		29					348	261	116
Poland.....	725	4,930	1,160	580		580			
Singapore.....							20		
Sweden.....							87	261	29
Switzerland.....		211						116	58
UK.....		106	200	316		178	841		
US.....						99	670	348	4,263
USSR.....		2,900		2,900	1,450				
West Germany.....		2,436	122			1,085	1,015	377	435
Other.....	21,125	706	3,362	1,929	2,500	4,401	3,447	1,102	580
Total.....	21,850	13,000	5,000	6,000	4,000	7,000	8,000	3,934	8,032
Thousand US \$									
Value.....	5,442	2,764	1,131	1,425	1,019	1,945	2,090	832	719

¹Preliminary.²29 flasks equal 1 metric ton.³An ellipsis represents zero.

Molybdenum

China's molybdenum reserves are among the world's largest. A deposit near Chin-hsi in the northeast is probably the second-largest in the world. The Japanese estimated these reserves at 8 million to 10 million tons (0.33- to 0.39-percent molybdenum) while the Chinese have claimed reserves of 70 million tons (0.16- to 0.3-percent molybdenum). China also claims a major deposit in Shensi and smaller ones in the south and southeast.

China's current molybdenum production is unknown. Production in the late 1950s was probably 3,000 to 4,000 tons annually, of which several thousand tons of concentrates (in terms of molybdenum content) were exported, primarily to the USSR. Since 1970, however, the only known sale to the USSR was 200 tons of concentrates in 1971 (table A-15). In 1974 the Netherlands imported 30 tons of concentrates, but no Chinese exports have been observed in either 1975 or 1976. Thus, although domestic consumption has probably climbed considerably from the few hundred tons consumed annually in the 1960s, it is unlikely that production has regained the level of the late 1950s.

China has imported small quantities of molybdenum metal from Japan and probably some ferromolybdenum from Austria. Metal imports have ranged between six tons in 1971 to less than 0.5 tons in 1974. Small amounts of metal may be produced at a plant in Peking, while the Kirin Ferroalloy Plant produces most of China's requirements of ferromolybdenum.

Nickel

China's nickel resources are small, and imports make up most of its nickel supply. Limited resources have been reported in southwest and northwest China, but the extent of their development is unknown. Total domestic production is only a few thousand tons a year.

Nickel imports rose sharply from 1970-74 before falling dramatically in 1975 and 1976 (table A-16). The 29,000 tons imported in 1973 and 1974 are the highest tonnages noted under the Communist regime. The rise in imports was necessitated by a jump in stainless steel output to support the rapidly expanding petroleum and chemical industries. The decline in 1975 and 1976 probably occurred because stocks had been built up during the previous few years and production problems in the steel industry reduced the need for nickel used in stainless steel production. Canada has by far been the leading supplier of nickel during the 1970s, even though exports stopped in 1976. Other major sources include France, the Netherlands, the United Kingdom, and West Germany. Cuba provides some nickel oxide; and Albania, some nickel ores.

Table A-15
China: Exports of Molybdenum Ores and Concentrates

	1965	1971	1974
	Metric Tons		
France	137	..	..
Japan	37	..	..
Netherlands .....	..	..	30
Poland	102	..	..
USSR .....	..	200	..
Total	276	200	30
	Thousand US \$		
Value	996	302	136

¹ An ellipsis represents zero.

Table A-16
China: Nickel Imports

	1957	1965	1970	1971	1972	1973	1974	1975	1976 ¹
	Metric Tons								
Albania .....	..²	750	750	750	750	750	750	750	750
Canada .....	..	2,063	250	5,613	22,540	20,004	500	..	..
Cuba	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000
Finland	113	..	150	300	100	8	..	..	..
France	3,110	1,095	1,100	41	36	..	1	..	..
Japan .....	..	16	120	8	7	15	10	6	..
Netherlands .....	..	..	1,261	141	371	111	..	..	1
Norway .....	..	..	..	1,010	..	975	..	..	..
Sweden	68	..	23	..	51	5	Negl	1	..
UK	8	378	..	615	200	1	Negl	..	..
USSR	68	1,563	..	..	..	..	..	..	5,000
West Germany .....	..	843	362	168	165	3	21	..	..
Other ³	1,932	545	2,336	6,178	5,357	3,942	6,110	3,039	1,242
Total	2,000⁴	8,000	8,000	11,000	15,000	29,000	29,000	5,300	8,000
	Thousand US \$								
Value	4,116	16,344	38,880	36,028	45,901	104,544	105,187	22,291	17,255

¹ Preliminary.

² An ellipsis represents zero.

³ Most of these imports probably originate in the USSR, though they are not included in official Soviet statistics. The remainder probably are transshipments from nickel producers in Western Europe.

⁴ No information available for 1957. The 1957 figure probably was somewhat less than the 2,906 tons imported in 1958.

Platinum

Practically no information is available on Chinese platinum. Both production and reserves, however, are probably small. China imports the bulk of its platinum needs (table A-17). Imports peaked in 1973 when about \$27 million worth of platinum was purchased. Imports in 1976 were more than \$4 million. West Germany and the United Kingdom have been China's major sources of platinum. These countries supplied 42 percent of imports in 1976. Despite a decline in purchases in the last few years, imports will continue to be needed.

Tantalum

Little is known about China's tantalum industry. Reserves have been reported in several provinces, including Hunan, Sinkiang, Shensi, Kwangtung, and Kwangsi. No production data on tantalum concentrate or metal is available. The Chinese may be able to produce some tantalum, as they were seeking technology to produce the metal in the 1960s. Small quantities of the metal were being imported during the early 1970s (table A-18); however, no imports have been noted since 1974, indicating that China may now be self-sufficient. Tantalum is used primarily for filaments in radio tubes and incandescent lamps and as a corrosion resistant material for chemical equipment, electrical contacts, and surgical and dental instruments.

Table A-17
China: Platinum and Platinum Metals Imports

	1957	1965	1970	1971	1972	1973	1974	1975	1976 ¹
	Kilograms								
France .....	..²	185	..	..	31	..	..	..	25
Hong Kong	11	..	..	..	..	..	..	..	..
Japan	11	3	257	12	497	1,401	209	9	..
Netherlands .....	..	122	..	..	..	..	..	..	..
UK	66	1,779	1,690	478	1,709	1,232	557	167	149
US .....	..	..	..	..	..	533	81	..	Negl
West Germany	233	3,449	1,042	371	1,616	1,121	25	39	351
Other ³	179	162	211	439	447	1,313	728	785	675
Total	500	5,700	3,200	1,300	4,300	5,800	1,600	1,000	1,200
	Thousand US \$								
Value	1,282	21,173	16,860	2,707	18,982	26,734	7,477	5,021	4,150

¹ Preliminary.

² An ellipsis represents zero.

³ Including rough estimates for shipments from the USSR. In addition, data for the UK and other Western European countries did not necessarily include all of the platinum metals for some years.

Table A-18
China: Imports of Tantalum

	1971	1972	1973	1974
	Metric Tons			
Japan	1	1	0.3	0.6
Total	1	1	0.3	0.6
Thousand US \$				
Value	81	171	24	60

Tin

China's tin reserves are extremely large. Estimates vary widely, but they probably total at least 500,000 tons. The majority of reserves are located in Yunnan, Kwangtung, Hunan, Kiangsi, and Kwangsi Provinces; however, the area of Ko-chiu in southern Yunnan Province probably supplies three-fourths of China's total output.

Soviet assistance enabled tin production to jump from about 6,000 tons in 1950 to more than 30,000 tons in both 1958 and 1959. The withdrawal of Soviet technicians, coupled with technical difficulties arising from overused machinery during the Great Leap Forward (1958-60), caused production to drop sharply in the 1960s. China's highest production since then was an estimated 18,000 tons produced in 1975. Estimated tin output since 1970 is as follows (in thousand metric tons):

1970	1971	1972	1973	1974	1975	1976
10	13	12	15	15	18	11

Of the 11,000 tons produced in 1976, 6,400 tons were exported (table A-19). Sales to non-Communist countries now comprise the bulk of exports, compared with the 1950s when the USSR was the major recipient of Chinese tin. Sales to the United States now comprise a significant portion of China's tin exports. These sales peaked in 1975, when the United States purchased 6,400 tons. In 1976 sales dropped to about 1,700 tons. The Netherlands, West Germany, and France are other major importing countries.

With minor fluctuations, tin consumption has been fairly constant. Consumption in 1976 of 4,600 tons is about equal to the average annual consumption for the decade. China imports a large part of its requirements for tinplate, the major use of tin in the developed countries. Once new tinplating lines at the Wuhan Steel Plant are completed, tin consumption will increase sharply. China's tin resources are adequate to meet foreseeable increases in consumption and exports.

Table A-19

China: Exports of Tin

	1957	1965	1970	1971	1972	1973	1974	1975	1976 ¹
	Metric Tons								
Australia	30								2
Austria	88	5	5	63	214	99	13	5	
Belgium-Luxembourg ..			20	55	20	14	20	5	
Canada				575	500	190	191		
Colombia			7	5					
Czechoslovakia	105	30	70	70	30	110			7
Denmark	488	594	724	266	175	45	100	170	
Egypt	409	50	54						
Finland	25	264	75	148	20	85	151	25	45
France		1,873	1,796	1,878	1,530	1,668	1,280	1,461	658
Hong Kong	17	70	21	41	73	134	75	94	125
Hungary	499		160	80	100	300	225		366
Iran							5		
Italy		106		15	406	731	239	30	265
Japan		1,706	200	191	508	709	830	443	217
Netherlands	99	420	684	1,384	1,195	920	1,462	1,087	1,000
Norway		221	21	40	15	15	1		
Pakistan			34	24	19	21	29		
Poland	501	130	310	879	605	325	100	972	435
Romania			899	650					
Sweden		218		58	60	30		45	5
Switzerland	195		15	20		23	71	35	15
Tanzania							2		
UK		335				20	110	13	
US					163	1,755	3,336	6,378	1,727
USSR	22,000	500	200	500	806	501	500		
Venezuela			5	3					
West Germany	50	467	481	996	871	747	634	996	802
Yugoslavia						50			
Other	205	629	416	467	601	527	692	997	551
Total	24,000	7,700	6,000	8,200	8,000	9,500	10,200	12,900	6,400
	Thousand US \$								
Value	49,594	26,853	19,867	26,229	27,112	39,253	46,901	86,123	46,372

¹ Preliminary² An ellipsis represents zero.

Titanium

China produces small quantities of titanium dioxide (from ilmenite) and titanium metal (from rutile). Most of the titanium ore resources in China are ilmenite, although small deposits of rutile are also present.

Little information is available on metal production; however, in the 1960s China reportedly was seeking a titanium sponge plant from Japan and may now be able to produce a small quantity of titanium metal.

Titanium trade consists of a small amount of both imports and exports. Most of this trade is with Japan. Titanium oxide exports were \$450,000 in 1976 (table A-20). Imports consisting of ores, oxide, and metal amounted to \$815,000 (table A-21).

Consumption of titanium metal is thought to be small; however, consumption should rise as more is used for alloying. China's resources are sufficient to enable it to satisfy any increased demand from domestic production.

Table A-20
China: Exports of Titanium Oxide

	1971	1972	1973	1974	1975	1976 ¹
	Metric Tons					
Canada	11	.....²	.....	.....	.....	.....
Japan	130	701	625	490	216	669
Total	141	701	625	490	216	669
	Thousand US \$					
Value	41	125	295	433	189	450

¹ Preliminary.

² An ellipsis represents zero.

Table A-21
China: Imports of Titanium Ores, Oxide, and Metal

	1957	1965	1970	1971	1972	1973	1974	1975	1976 ¹
Australia .....	.....²	118	.....	.....	.....	.....	.....	.....	.....
Japan	1,152	.....	507	65	29	160	924	1,644	815
Sri Lanka .....	.....	.....	.....	.....	189	.....	.....	.....	.....
Total	1,152	118	507	65	218	160	924	1,644	815

¹ Preliminary.

² An ellipsis represents zero.

Tungsten

China's tungsten reserves—estimated at about 1 million tons—are the largest in the world. The majority of these reserves are located in southeastern China.

Production of tungsten concentrate in 1976 is estimated at about 11,900 tons. This is 36 percent less than that produced in 1973, the peak production year during the 1970s. Estimated tungsten production for 1970-76 is as follows (in thousand metric tons of 60-percent WO₃ concentrates):

1970	1971	1972	1973	1974	1975	1976
11.5	16.3	16.6	18.7	17.1	14.1	11.9

Half of current tungsten production is exported (table A-22). Exports in 1976 are estimated at 6,100 tons. The USSR used to be the major recipient of China's tungsten, receiving 35 percent of total exports in 1974. Soviet imports have since declined, and Western Europe and other Communist countries now take the bulk of Chinese exports. China also imports small amounts of high-purity tungsten metal from Japan; 10 tons were imported in 1976 (table A-23).

Tungsten is used mainly in carbides, tool steels, and other special alloys. The recent decline in tungsten production is due in part to the production problems of the steel industry. Evidence suggests that most of the easily accessible deposits have been worked out; future production increases will have to come from lower grade and more complex deposits. This may account for the decline in the volume of exports during 1975 and 1976.

Table A-22
China: Exports of Tungsten Ores and Concentrates

	1957	1965	1970	1971	1972	1973	1974	1975	1976 ¹
	Metric Tons of 60-percent WO ₃ Equivalent								
Austria.....	4	998	1,875	1,798	744	774	861	735	1,043
Belgium-Luxembourg					9	220	311	5	46
France	753	182	62	234	591	446	356	518	
Hong Kong					20			125	
Italy							35	135	20
Japan	174	88	79	141	263	288	169	105	
Netherlands				50	255	516	591	25	
Poland	800	701	405	401	502	541	610		
Sweden	523	788	269	422	658	636	861	262	
UK	1,703	424	30	479	865	417	232	110	
US					78	268	176	174	
USSR	28,000 ²	6,000	799	4,792	5,249	3,650	3,900	1,700	
West Germany		1,670	274	212	961	1,874	460	394	1,297
Other	1,700	1,379	1,969	2,403	2,405	2,289	2,346	2,077	2,525
Total	29,700	14,000	7,100	10,100	11,300	12,300	11,100	7,600	6,100
	Thousand US \$								
Value	29,492	22,372	26,178	24,576	23,198	29,912	36,122	47,076	43,005

¹ Preliminary

² An ellipsis represents zero.

³ No figure given in official trade data, but this large figure probably included a sizable share of Soviet imports of other metals, ores, and concentrates that amounted to \$87 million.

* Mostly to the other European Communist countries Bulgaria, Czechoslovakia, East Germany, Hungary, and Romania.

Table A-23
China: Imports of Tungsten Metal

	1965	1970	1971	1972	1973	1974	1975	1976 ¹	
	Metric Tons of 60-percent WO ₃ Equivalent								
France	2					20			
Japan	0.008	2	11	14	9	13	1	10	
Total	0.008	2	11	14	9	33	1	10	
	Thousand US \$								
Value	Negl	319	543	723	613	929	100	740	

¹ Preliminary

² An ellipsis represents zero.

Zinc

No quantitative estimates are available on China's zinc reserves. They are widespread, however, and are believed to be large. They should be sufficient for domestic needs for the foreseeable future and could support a sizable level of exports. Zinc production probably totals upwards of 125,000 tons yearly, making China nearly self-sufficient in zinc.

Zinc imports have fallen sharply in the last few years (table A-24). Imports in 1976 were only about one-third of the 1970 level. Peru supplied almost three-fourths of 1976 imports. Zinc exports, on the other hand, have expanded greatly in the 1970s (table A-25). Exports totaled only 300 tons in 1970 but jumped to 7,800 tons by 1976. China's zinc trade is now nearly in balance, and China may become a net exporter in the near future. Major importers of Chinese zinc include Hong Kong, the United Kingdom, and Switzerland.

Table A-24
China: Zinc Imports

	1957	1965	1970	1971	1972	1973	1974	1975	1976 ¹
	Metric Tons of Zinc Equivalent								
Australia	2		8,118	15,578			305	10	
Belgium-Luxembourg	363		2		204	70			
Canada			5,105						
Finland			5,000						
Hong Kong	588	1,443							
Italy	157							12	44
Japan		406	29	673	1	4	3		1
Netherlands							50		
Norway	300								
Peru				4,098	4,777	5,000	6,000	5,500	6,000
Poland	25								
UK	650								
Zambia			2,001						
Other	917	3,151	3,747	2,649	3,222	2,792	2,572	2,678	2,055
Total	3,000	5,000	24,000	23,000	8,000	8,000	9,000	6,200	8,100
Thousand US \$									
Value	939	1,853	7,666	4,545	2,964	4,824	9,720	7,341	12,150

¹Preliminary.

²An ellipsis represents zero.

Table A-25

	1957	1965	1970	1971	1972	1973	1974	1975	1976 ¹
	Metric Tons of Zinc Equivalent								
Bulgaria	140	2						174	336
France									
Hong Kong				207	167	178	1,166	2,403	
Iran				166	127	1			
Japan		30		137				29	515
Netherlands							482	448	
Norway								100	
Pakistan					401	302			
Portugal						150			
Singapore						54	4	105	
Sweden						295			
Switzerland								1,085	542
Tanzania							4		
UK								1,195	605
US								270	2,297
USSR	600					54			
West Germany								99	288
Other	260	170	300	163	227	997	1,766	1,629	269
Total	1,000	200	300	300	600	1,800	2,700	6,234	7,803
Thousand US \$									
Value	508	62	90	91	283	1,221	2,615	4,703	5,472

¹Preliminary.

²An ellipsis represents zero.

90

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